Rec'd PCT/PTO 14 MAR 2005

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REPUBLIC OF SOUTH AFRICA

Certificate
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DEPARTMENT OF TRADE AND
INDUSTRY

Hiermee word gesertifiseer dat
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IB/03/4051

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the documents attached hereto are true copies of the Forms P2, P6, provisional specification and drawings of South African Patent Application No. 2002/7516 in the name of De Villiers, Malan

PRIORITY DOCUMENT
SUBMITTED OR TRANSMITTED IN COMPLIANCE WITH RULE 17.1(a) OR (b)

Filed : 19 September 2002

Entitled : Arthroplasty Implant

Geteken te PRETORIA in die Republiek van Suid-Afrika, hierdie **20th** dag van **October 2003**
Signed at in the Republic of South Africa, this day of

Registrateur van Patente

SPOOR & FISHER

FORM P.1

REPUBLIC OF SOUTH AFRICA
REVENUE
HASR 711
THROMSTE
R 0 0 0.0 0

REPUBLIC OF SOUTH AFRICA
PATENTS ACT, 1978

APPLICATION FOR A PATENT
AND ACKNOWLEDGEMENT OF RECEIPT
(Section 30 (1) – Regulation 22)

The granting of a patent is hereby requested by the undermentioned applicant on the basis of the present application filed in duplicate

OFFICIAL APPLICATION NO.		S & F REFERENCE
21	01 2002/7516	PA133811/P

FULL NAME(S) OF APPLICANT(S)

71	DE VILLIERS, MALAN

ADDRESS(ES) OF APPLICANT(S)

	SOUTHERN IMPLANTS OFFICE PARK, BUILDING 10, 1ALBERT ROAD, IRENE, 1675, GAUTENG, SOUTH AFRICA

TITLE OF INVENTION

54	ARTHROPLASTY IMPLANT

THE APPLICANT CLAIMS PRIORITY AS SET OUT ON THE ACCOMPANYING FORM P.2. THE EARLIEST PRIORITY CLAIM IS:

COUNTRY:	NUMBER:	DATE:
NIL	NIL	NIL

~~THIS APPLICATION IS FOR A PATENT OF ADDITION TO PATENT APPLICATION NO.~~

21	01	

~~THIS APPLICATION IS A FRESH APPLICATION IN TERMS OF SECTION 37 AND IS BASED ON APPLICATION NO.~~

21	01	

THIS APPLICATION IS ACCOMPANIED BY:

- ☒ 1. A single copy of a provisional specification of 7 pages.
- ☒ 2. Drawings of 6 sheets.
- ☐ 3. Publication particulars and abstract (Form P.8 in duplicate).
- ☐ 4. A copy of Figure of the drawings (if any) for the abstract.
- ☐ 5. Assignment of invention.
- ☐ 6. Certified priority document.
- ☐ 7. Translation of the priority document.
- ☐ 8. Assignment of priority rights.
- ☐ 9. A copy of the Form P.2 and the specification of S.A. Patent Application No .
- ☒ 10. Declaration and power of attorney on Form P.3.
- ☐ 11. Request for ante-dating on Form P.4.
- ☐ 12. Request for classification on Form P.9.
- ☒ 13. Form P.2 in duplicate.
- ☐ 14. Other.

74	ADDRESS FOR SERVICE: SPOOR & FISHER, SANDTON

Dated: 19 September 2002

SPOOR & FISHER
PATENT ATTORNEYS FOR THE APPLICANT(S)

RECEIVED
2002 -09- 19
REGISTRATEUR VAN PATENTE, MODELLE, HANDELSMERKE EN OUTEURSREG

REGISTRAR OF PATENTS

REPUBLIC OF SOUTH AFRICA | REGISTER OF PATENTS | PATENTS ACT, 1978

OFFICIAL APPLICATION	LODGING DATE: PROVISIONAL	ACCEPTANCE DATE
21 01 2002/7516	22 19 SEP 2002	47
INTERNATIONAL CLASSIFICATION	LODGING DATE: COMPLETE	GRANTED DATE
51	23	

FULL NAME(S) OF APPLICANT(S)/PATENTEE(S)

71 DE VILLIERS, MALAN

APPLICANTS SUBSTITUTED: | DATE REGISTERED

71

ASSIGNEE(S) | DATE REGISTERED

71

FULL NAME(S) OF INVENTOR(S)

72 DE VILLIERS, MALAN

PRIORITY CLAIMED	COUNTRY	NUMBER	DATE
N.B. Use International abbreviation for country (see Schedule 4)	33 NIL	31 NIL	32 NIL

TITLE OF INVENTION

54 ARTHROPLASTY IMPLANT

ADDRESS OF APPLICANT(S)/PATENTEE(S)

SOUTHERN IMPLANTS OFFICE PARK, BUILDING 10, 1ALBERT ROAD, IRENE, 1675, GAUTENG, SOUTH AFRICA

ADDRESS FOR SERVICE | S & F REF

74 SPOOR & FISHER, SANDTON | PA133811/P

PATENT OF ADDITION NO. | DATE OF ANY CHANGE

61

FRESH APPLICATION BASED ON | DATE OF ANY CHANGE

SPOOR & FISHER

FORM P.6

REPUBLIC OF SOUTH AFRICA
PATENTS ACT, 1978

PROVISIONAL SPECIFICATION

(Section 30(1) – Regulation 27)

OFFICIAL APPLICATION NO.		LODGING DATE	
21	01 2002/7516	22	19 SEPTEMBER 2002

FULL NAMES OF APPLICANTS

71	DE VILLIERS, MALAN

FULL NAMES OF INVENTORS

72	DE VILLIERS, MALAN

TITLE OF INVENTION

54	ARTHROPLASTY IMPLANT

"ARTHROPLASTY IMPLANT"

BACKGROUND TO THE INVENTION

THIS invention relates to an arthroplasty implant.

The invention is particularly concerned with arthroplasty implants of the wrist and small bones of the hand and foot, such as metatarsophalangeal (MTP) joint implants, metacarpophalangeal (MCP) joint implants and proximal interphalangeal (PIP) joint implants.

Various types of implants for such joints have been proposed and are in use. It is however believed that the known implants, most of which are of two part construction, suffer from one disadvantage or other that either limits their flexibility, load-transmitting ability or life expectancy.

SUMMARY OF THE INVENTION

According to the present invention there is provided an arthroplasty implant for providing a joint between first and second members of the body, the implant comprising:

- a first component defining a concave surface and having connection means connectable to the first body member;

- a second component defining a convex surface and having connection means connectable to the second body member;

- an intermediate component located between the first and second components and defining a convex surface which is slidable complementally on the concave surface of the first component to allow articulation between the first component and the intermediate component and a concave surface slidable complementally on the convex surface of the second component to allow articulation between the second component and the intermediate component, and

- means for preventing the intermediate component from separating laterally from the first component or the second component.

In the preferred embodiment, the concave surface of the first component and the convex surface of the intermediate component are complementally, spherically curved and there is a central projection on the concave surface of the first component which locates loosely in a central opening in the convex surface of the intermediate component to prevent lateral separation of the intermediate component from the first component.

Preferably also, the concave surface of first component and the convex surface of the intermediate component are bounded by peripheral edges

which contact one another when articulation between the first component and the intermediate component reaches a predetermined limit.

The area of the convex surface of the second component may be substantially greater than the area of the concave surface of the intermediate component, allowing both sliding movement and articulation to take place between the second component and the intermediate component.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described in more detail, by way of example only, with reference to the accompanying drawings in which:

Figure 1 shows a perspective view of a first component of an arthroplasty implant according to the invention;

Figure 2 shows side view of the component seen in Figure 1;

Figure 3 shows a perspective view of a second component of an arthroplasty implant according to the invention;

Figure 4 shows a side view of the component seen in Figure 3;

Figure 5 shows a plan view of the component seen in Figure 3;

Figure 6 shows a perspective view of an intermediate component of an arthroplasty implant according to the invention;

Figure 7 shows a plan view of the intermediate component seen in Figure 6;

Figure 8 shows a cross-section at the line 8-8 in Figure 7;

Figure 9 shows a cross-section at the line 9-9 in Figure 7;

Figure 10 shows a side view of an assembled arthroplasty implant according to the invention with the first and intermediate components in a neutral position before articulation between them;

Figure 11 shows a similar side view of the assembled arthroplasty implant after maximum articulation between the first and intermediate components; and

Figure 12 shows a plan view of the assembled arthroplasty implant after maximum articulation between the first and intermediate components.

DESCRIPTION OF A PREFERRED EMBODIMENT

The drawings illustrate individual components of a metatarsophalangeal (MTP) joint implant, and the assembled MTP implant. The implant consists of three individual components illustrated in Figures 1 and 2, Figures 3 to 5 and Figures 6 to 9 respectively.

Figures 1 and 2 illustrate a first, phalangeal component 10 which is connected in use to a phalanx. It includes a body 12 formed with a spherically curved, concave surface 14. Projecting centrally from the surface 14 is a conical peg 16 and projecting rearwardly from the body 12 is a tapered post 18 of square cross-section. In use, the post 18 is placed in a predrilled hole in the phalanx.

Figures 3 to 5 illustrate a second, tarsal component 20 which is connected in use to the associated tarsus. It includes a body 22 with a convexly curved surface 24 and curved skirts 26, 28. The radius of curvature of the surface 24 in the view of Figure 4 is less than the radius of curvature in the

view of Figure 5. Projecting rearwardly from the body 22 is a tapered post 30 of square cross-section. In use the post 30 is placed in a predrilled hole in the tarsus.

Both the phalangeal component 10 and the tarsal component 20 are made in one piece of grade 5 titanium, their curved surfaces 14 and 24 being provided with a titanium nitride finish.

Figures 6 to 9 illustrate an intermediate component in the form of a meniscus 32 which is located in the assembled MTP implant between the phalangeal and tarsal components 10 and 20. The meniscus 32 is made of a low friction plastic material, in this case an ultra high molecular weight polyethylene (UHMWPE) available under the name ORTHOSOL. One side of the meniscus is formed with a concave surface 34 and the opposite side with a convex surface 36. The convex surface is spherically curved and is formed centrally with a conical recess or socket 38. The concave surface 34 is not spherical. The radius of curvature of the surface 34 in Figure 8, which is the same as the radius of curvature of the surface 24 in Figure 4, is less than the radius of curvature of the surface 34 in Figure 9, which is the same as the radius of curvature of the surface 24 in Figure 5. It will accordingly be understood that the concave surface 34 of the meniscus is complemental to the convex surface 24 of the tarsal component 24, and that the convex surface 36 of the meniscus is complemental to the concave surface 14 of the phalangeal component 10.

Figures 10 to 12 illustrate the assembled MTP arthroplasty implant 40, consisting of the three components 10, 20 and 32. The meniscus 32 is located between the phalangeal and tarsal components 10 and 20 with the various concave and convex surfaces in cooperating relationship with one another. The peg 16 of the phalangeal component is located in the socket 38 of the meniscus 32. In this regard it will be noted that the transverse dimension of the peg is somewhat less than the transverse dimension of the socket at any given point along the length of the peg and socket.

In Figure 10, the phalangeal component 10 and the meniscus 32 are at a neutral orientation with one another, i.e. they are axially aligned and no articulation has taken place between them. Figure 11 illustrates the situation after maximum permitted articulation has taken place between these components. It will be noted that at the condition of maximum articulation, edge regions of the phalangeal component 10 and meniscus 32 come into contact with one another, as indicated by the arrow 42. Further articulation in the same sense past this condition is impossible. The fact that the socket 38 is oversize with respect to the peg 16 permits maximum articulation to take place, but it will be noted in Figure 11 that, in the condition of maximum articulation, the peg abuts the side of the socket, also preventing further articulation.

Throughout the permitted range of articulation between the phalangeal component and the meniscus, the peg 16 remains located in the socket 38. This prevents the meniscus from separating laterally from the phalangeal component, i.e. holds the meniscus captive relative to the phalangeal component at all times.

In Figures 10 and 11, there is no change in the positional relationship of the meniscus and the tarsal component 20. Given the complemental curvature of their respective convex and concave surfaces, it will however be understood that these components are free to slide over one another and, in doing so, to articulate relative to one another. This is illustrated by Figure 12, which shows the meniscus, and with it the phalangeal component, after relative sliding and articulation has taken place. The convex surface 24 of the tarsal component 20 is substantially larger than the complemental concave surface 34 of the meniscus, allowing sliding and articulation to take place.over a wide range and positions and angles.

It is believed that the three component implant described above and illustrated in the drawings will provide for substantial flexibility in the implanted arthroplasty. Also, the relatively large bearing areas between the respective components will, it is believed, provide the arthroplasty with

substantial longevity. Referring in particular to the phalangeal component 10 and the meniscus 32, the fact that these components are retained in their cooperating relationship by the peg 16 locating centrally in the socket 38 means that there still remains a relatively large bearing area around the peg and socket to transmit generally axial loading.

Many modifications are possible within the scope of the invention. For instance, the posts 18 and 30 could have a round cross-section. Also, although it is considered beneficial for the peg to abut the side of the socket, as illustrated in Figure 11, this is not critical to the performance of the implant. Further, while specific mention has been made of an MTP arthroplasty implant, but it will be understood that the principles of the invention are equally applicable to other arthroplasty implants, typically for the wrist or small bones of the hand or foot.

DATED THIS 19TH DAY OF SEPTEMBER 2002

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SPOOR & FISHER
APPLICANT'S PATENT ATTORNEYS

FIG 1

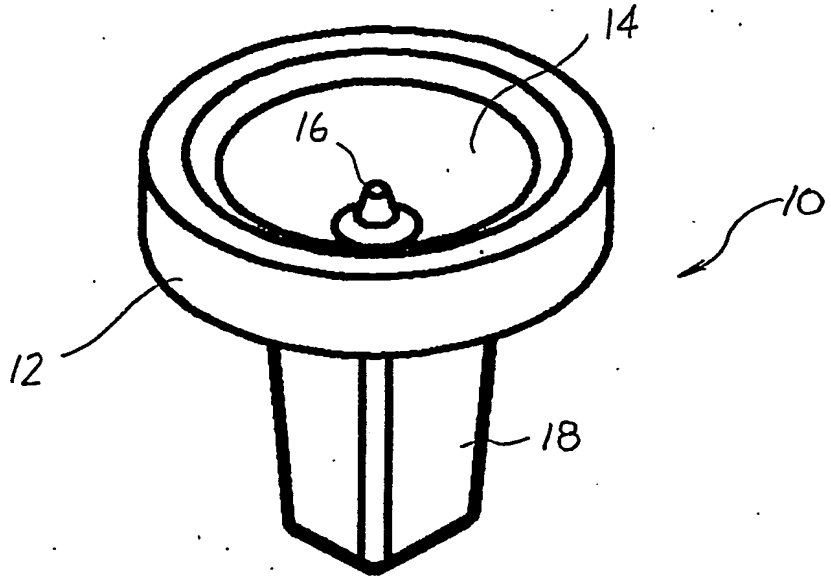

FIG 2

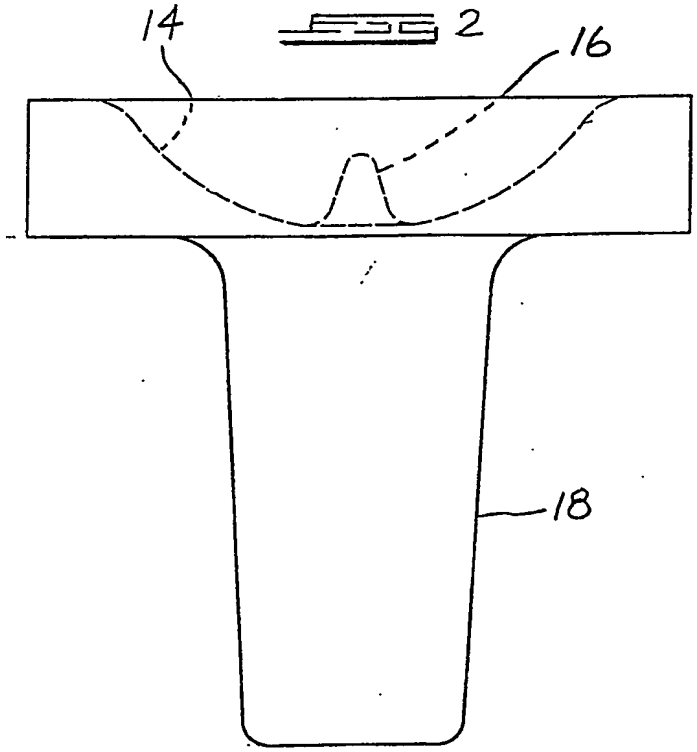

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Fig 3

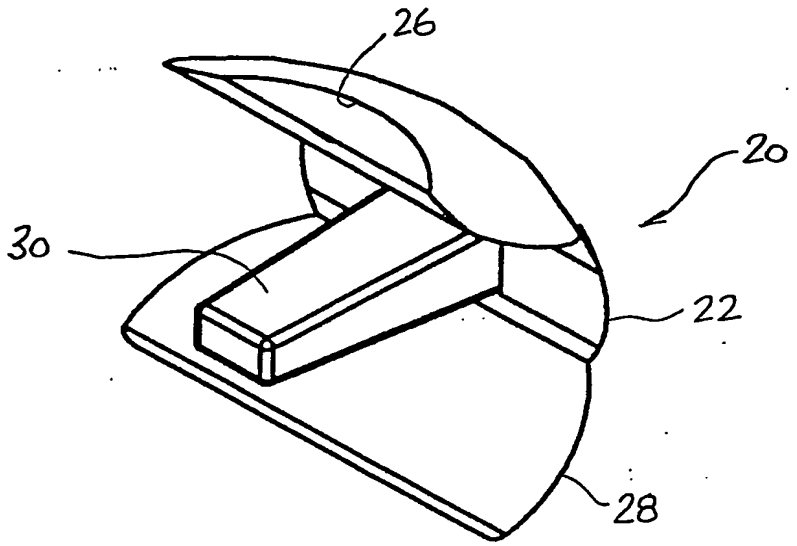

Fig 4

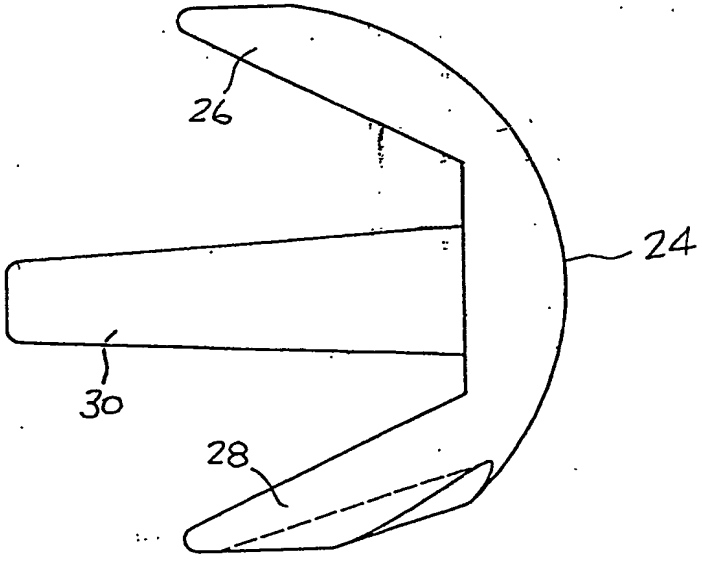

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Fig 5

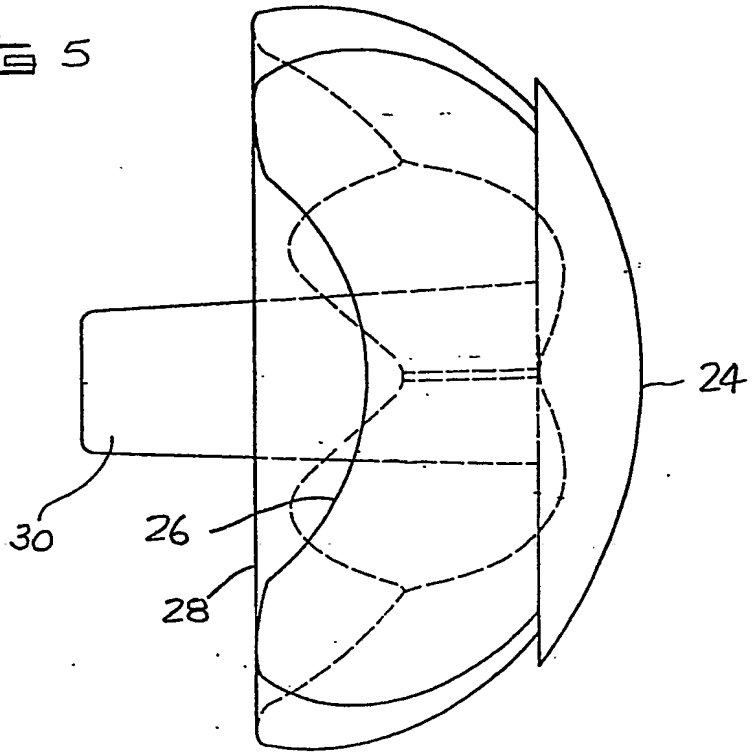

Fig 6

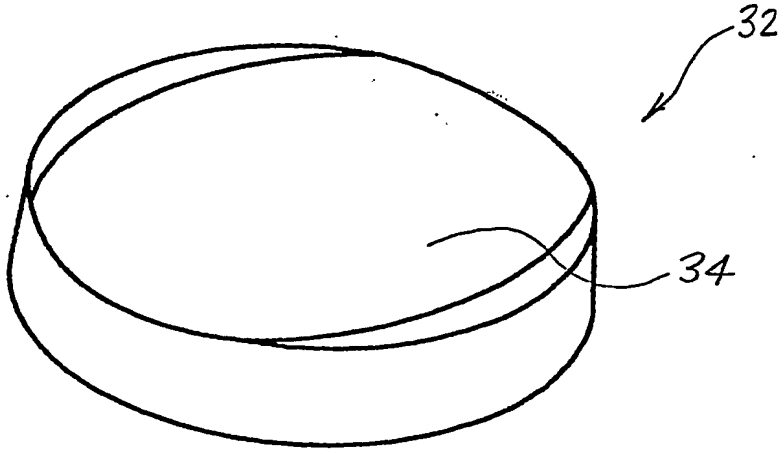

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FIG 7

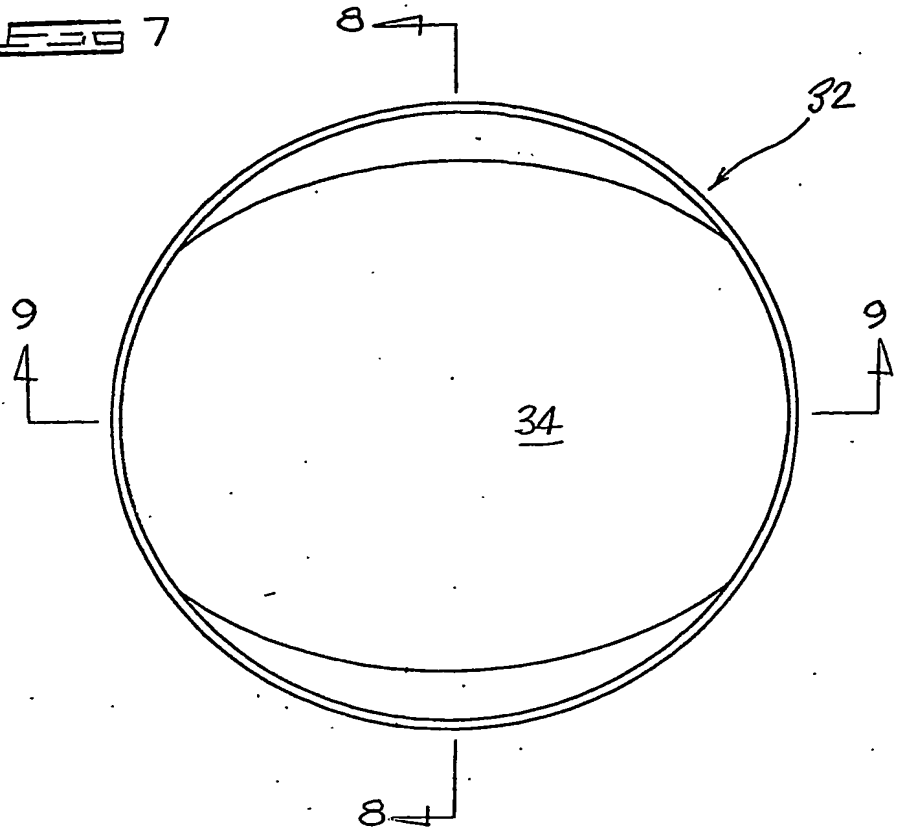

FIG 8

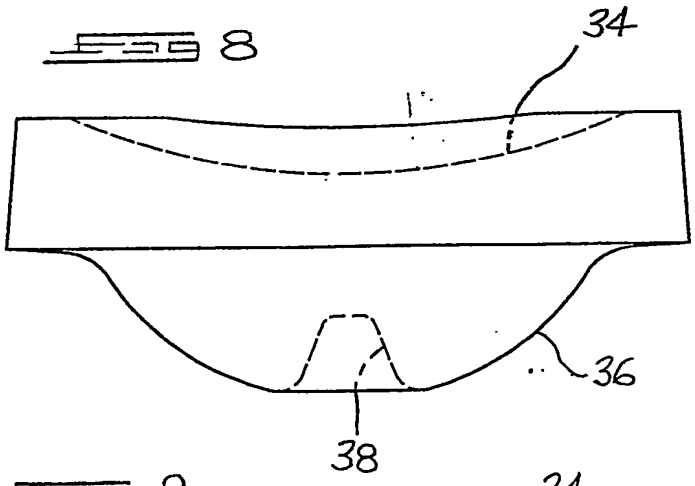

FIG 9

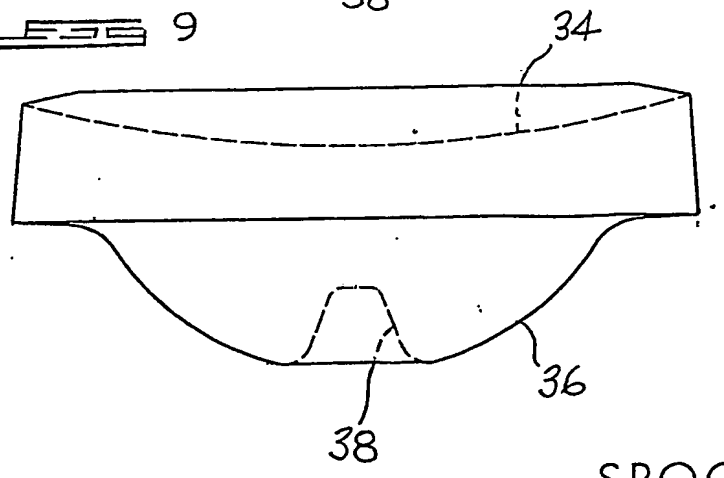

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FIG 10

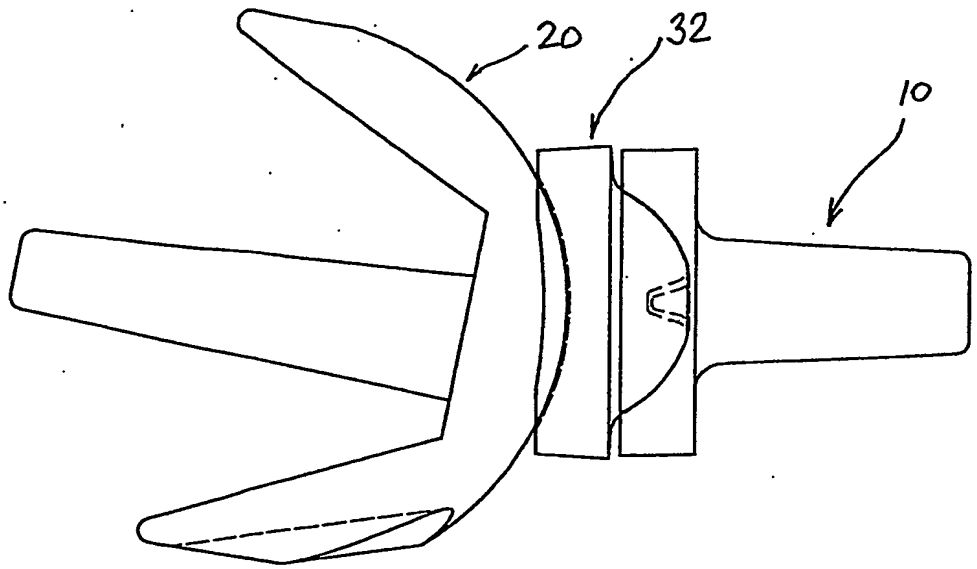

FIG 11

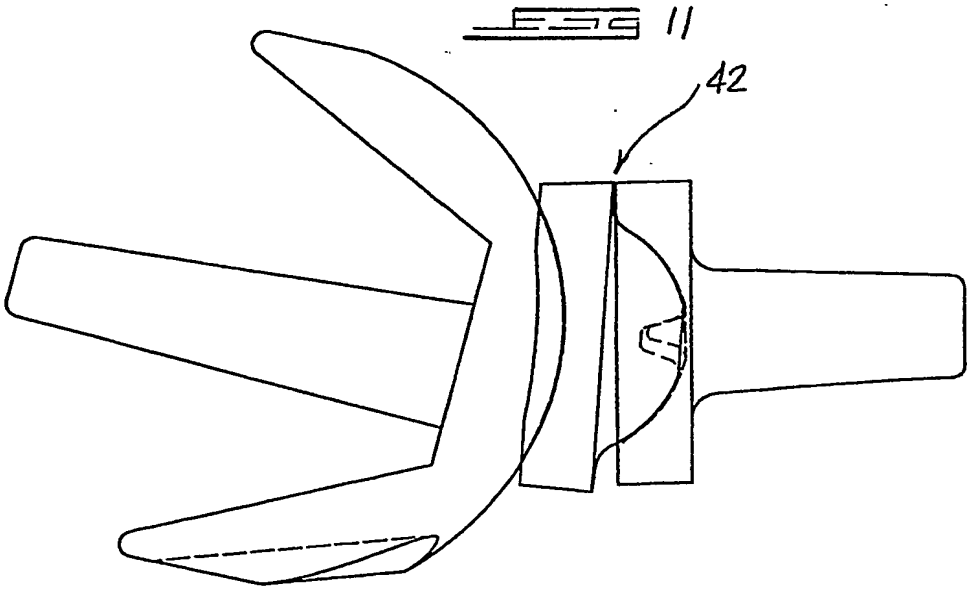

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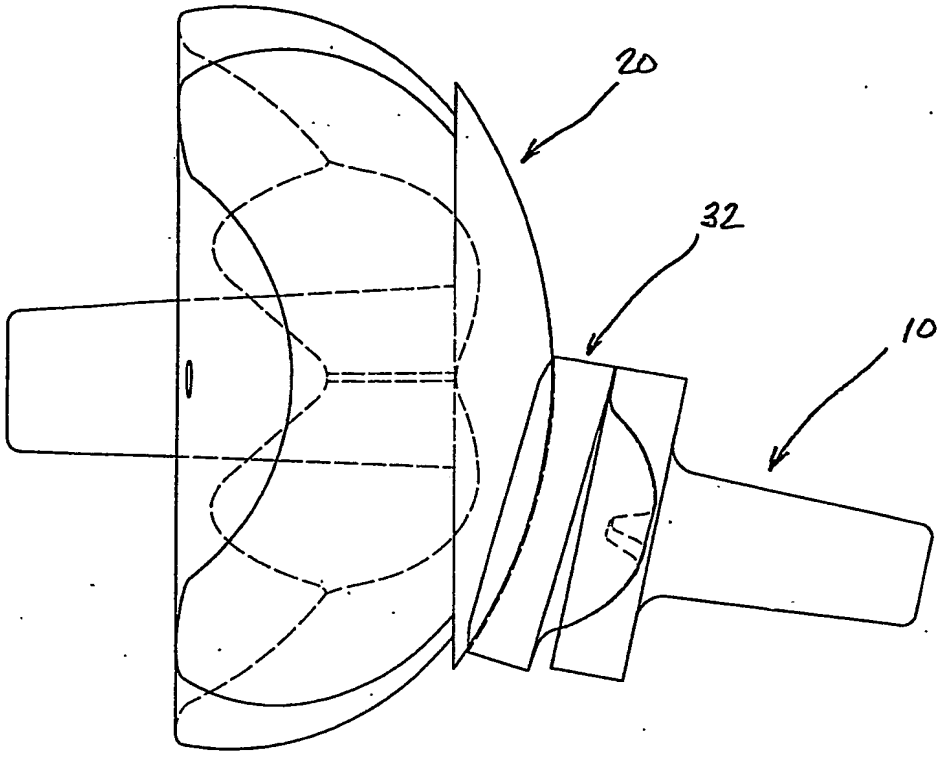
FIG 12



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